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Patent  
100325.0144US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
WASHINGTON, D.C. 20231

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Steven W., and Milliken, Adam S.**

Serial No: **10/031856**

Filed: **October 23, 2001**

For: **Methods And Apparatus For  
Mixing Fluids**

Examiner: **Not yet determined**

Art Unit: **Not yet determined**

**PRELIMINARY AMENDMENT**

The Honorable Commissioner  
of Patents and Trademarks  
Washington, D.C. 20231

Dear Sir:

Please enter the following as a preliminary amendment.

**IN THE CLAIMS**

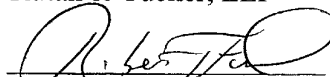
1. (Amended) A bubble cap comprising:  
a riser having a top;  
a cap having a bottom and at least one side [slit] slot, the cap disposed in relation to the  
riser such that a fluid flows in a space between the riser and the cap; and  
a divider disposed in the space, and extending to a length at least 50% of a distance  
measured between the top of the riser and the bottom of the cap.

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Respectfully submitted,  
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Dated: 8 Feb 2002

By:



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Marked up Copy of Current Claims

1. (Amended) A bubble cap comprising:  
a riser having a top;  
a cap having a bottom and at least one side [slit] slot, the cap disposed in relation to the riser such that a fluid flows in a space between the riser and the cap; and  
a divider disposed in the space, and extending to a length at least 50% of a distance measured between the top of the riser and the bottom of the cap.
2. The bubble cap of claim 1 wherein the length of the divider is at least 70% of the distance between the top of the riser and the bottom of the cap.
3. The bubble cap of claim 1 wherein the length of the divider is at least 90% of the distance between the top of the riser and the bottom of the cap.
4. The bubble cap of claim 1 wherein the length of the divider is 100% of the distance between the top of the riser and the bottom of the cap.
5. The bubble cap of claim 1 wherein the divider is attached to the riser.
6. The bubble cap of claim 1 wherein the divider is attached to the cap.
7. The bubble cap of claim 1 wherein the divider is attached to both the riser and the cap.
8. The bubble cap of claim 1 wherein the bubble cap has at least two dividers.
9. The bubble cap of claim 1 wherein the bubble cap has at least three dividers.
10. The bubble cap of claim 1 wherein the bubble cap has at least six dividers.
11. The bubble cap of claim 1, further comprising a swirl director attached to the riser.
12. A mixing device having a plurality of bubble caps according to claim 1.
13. A mixing device having a bubble cap of claim 1 wherein the bubble cap, having at least one slot, is positioned with respect to a distribution plate and the bottom of the cap is positioned at least 1.5 inches from the distribution plate.
14. A bubble cap, comprising:  
a cap with at least one slot and a riser configured to provide the cap with a skirt height of no less than 1.5 inches.
15. The bubble cap of claim 14, wherein the skirt height is no less than 2.5 inches.
16. The bubble cap of claim 14, wherein the skirt height is no less than 4 inches.

17. The bubble cap of claim 14 wherein the cap has a side that includes at least three slots.
18. The bubble cap of claim 14, wherein the slot has a length of at least 2.5 inches.
19. The bubble cap of claim 14, wherein the slot has a length of at least 3.5 inches.
20. The bubble cap of claim 14, wherein the slot has a length of at least 5 inches.
21. A distribution device comprising:
  - a plurality of flow-redirecting vanes,
  - an upper plate;
  - a lower plate, the plates disposed in relation to the vanes such that a fluid flows in a space between the plates and the passageways formed by the vanes; and
  - a distribution tray, disposed below the lower plate.
22. The distribution device of claim 16 wherein the flow-redirecting vanes are chevron-type vanes.
23. The distribution device of claim 16 wherein the distribution tray is a perforated plate.
24. The distribution device of claim 16 wherein the distribution tray is a bubble cap tray.
25. The distribution device of claim 16 wherein the distribution tray is a riser tray.

## Clean Copy of Current Claims

1. A bubble cap comprising:  
a riser having a top;  
a cap having a bottom and at least one side slot, the cap disposed in relation to the riser such that a fluid flows in a space between the riser and the cap; and  
a divider disposed in the space, and extending to a length at least 50% of a distance measured between the top of the riser and the bottom of the cap.
2. The bubble cap of claim 1 wherein the length of the divider is at least 70% of the distance between the top of the riser and the bottom of the cap.
3. The bubble cap of claim 1 wherein the length of the divider is at least 90% of the distance between the top of the riser and the bottom of the cap.
4. The bubble cap of claim 1 wherein the length of the divider is 100% of the distance between the top of the riser and the bottom of the cap.
5. The bubble cap of claim 1 wherein the divider is attached to the riser.
6. The bubble cap of claim 1 wherein the divider is attached to the cap.
7. The bubble cap of claim 1 wherein the divider is attached to both the riser and the cap.
8. The bubble cap of claim 1 wherein the bubble cap has at least two dividers.
9. The bubble cap of claim 1 wherein the bubble cap has at least three dividers.
10. The bubble cap of claim 1 wherein the bubble cap has at least six dividers.
11. The bubble cap of claim 1, further comprising a swirl director attached to the riser.
12. A mixing device having a plurality of bubble caps according to claim 1.
13. A mixing device having a bubble cap of claim 1 wherein the bubble cap, having at least one slot, is positioned with respect to a distribution plate and the bottom of the cap is positioned at least 1.5 inches from the distribution plate.
14. A bubble cap, comprising:  
a cap with at least one slot and a riser configured to provide the cap with a skirt height of no less than 1.5 inches.
15. The bubble cap of claim 14, wherein the skirt height is no less than 2.5 inches.
16. The bubble cap of claim 14, wherein the skirt height is no less than 4 inches.

17. The bubble cap of claim 14 wherein the cap has a side that includes at least three slots.
18. The bubble cap of claim 14, wherein the slot has a length of at least 2.5 inches.
19. The bubble cap of claim 14, wherein the slot has a length of at least 3.5 inches.
20. The bubble cap of claim 14, wherein the slot has a length of at least 5 inches.
26. A distribution device comprising:  
a plurality of flow-redirecting vanes,  
an upper plate;  
a lower plate, the plates disposed in relation to the vanes such that a fluid flows in a space between the plates and the passageways formed by the vanes; and  
a distribution tray, disposed below the lower plate.
27. The distribution device of claim 16 wherein the flow-redirecting vanes are chevron-type vanes.
28. The distribution device of claim 16 wherein the distribution tray is a perforated plate.
29. The distribution device of claim 16 wherein the distribution tray is a bubble cap tray.
30. The distribution device of claim 16 wherein the distribution tray is a riser tray.